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THE SCHICK TEST IN THE NEGRO.

Thesis for the degree of Doctor of Public Health

F. E. Coughlin.

May 15, 1922

The Schick Test in the Negro.

Submitted by F.E. Coughlin to the Department of Epidemiology as thesis for the degree of Doctor of Public Health . May 15, 1922.

This paper is based on a study of the Schick test in three colored institutions in Baltimore and the vicinity, by the Departments of Immunology and Epidemiology of the School of Hygiene and Public Health, and upon certain unpublished date made available by the Department of Epidemiology.

The Schick Test in The Negro.

1. Diphtheria Mortality and Morbidity in the Negro.

2. Previous work on the Test in the Colored.

3. Results of the Schick test in Three Colored Institutions.

   (a) St. Elizabeth's Home, Baltimore
   (b) St. Katherine's Home, Baltimore
   (c) Cheltenham Reformatory, Cheltenham.

4. Comparison of these Results with experience in Whites.

5. Factors Influencing the per cent of Positive Reactions.

In studying the incidence of diphtheria in Baltimore it was noticed that this disease occurs relatively less frequently in the negro population than in the white. In Baltimore in 1920 (1) only four negroes died from diphtheria and but 35 cases were reported, making the mortality rate for the year 3.69 per hundred thousand and the morbidity rate 32. The rates in the white population during the same period were much higher, the mortality being 15.3 per hundred thousand the the morbidity 241 per hundred thousand.

In the cities and states of the registration area reporting diphtheria deaths by color, this same difference occurs to a more or less degree, as shown by the mortality statistics of the Census Bureau and other reports (See Table 1) .

Fowler (2) studied the incidence of diphtheria in Washington in the two races for twenty-four years (1896 to 1919 inclusive) and found that during that period the mortality was lower in the negro although the case fatality was higher. The morbidity rate during this period averaged 218 per hundred thousand in the whites and 133 in the negroes. The mortality was 13.2 in the whites and 11.5 in the negroes.

The question arises whether this difference is due to the presence of anti-toxin in the blood of a larger percent of negroes than whites or to some other factor or factors. In order to answer this question the literature was consulted with reference to the Schick test in the two races.

(1) Report of the Health Department of the City of Baltimore 1920.
(2) Fowler, W.C. Annual Report of the Health Officer, District of Columbia, June 30, 1920, Page 197.

Table 1.

DIPHTHERIA AND CROUP.

Death Rates per 100000 in Registration Area by Color (1910-1917)

	TOTAL		URBAN		RURAL	
Year	White	Colored	White	Colored	White	Colored
1910	21.8	11.4	26.2	13.5	16.1	9.6
1911	19.3	9.8	21.8	10.8	15.4	8.1
1912	18.6	9.7	19.9	11.1	15.7	8.4
1913	19.3	11.0	22.1	10.9	14.9	10.4
1914	18.2	11.0	21.3	11.4	14.8	8.8
1915	15.9	10.2	17.9	9.0	13.0	11.2
1916	14.8	9.2	16.7	11.1	12.0	8.5
1917	17.1	8.7	19.8	10.8	12.7	7.5

Since 1913 when Schick reported his method for determining the immunity or susceptibility of an individual to diphtheria by means of the intracutaneous injection of minute quantities of diphtheria toxin, a large amount of work has been done on the subject in this country by Park and Zingher and others, and a large amount of literature has been published on the subject, but it appears that very little of the studies have been made with any reference to the colored race.

In 1917 Wright [3] reported the results of Schick tests at the Freedman's Hospital, Washington, D. C. during an outbreak of diphtheria which occurred at that institution from December 20, 1915 to January 31, 1916.

The test was performed on 3 white and 207 colored adults. The ages varied from 20 to 40 years. Of the 210 tested, 86 or 40.95% were found positive. No difficulty was experienced in reading the reactions, especially in the stage of pigmentation. It was found that the pigment was always darker than the skin of the person tested. Wright remarks that "it is only what one would expect, that is, that a pigmented race should show a greater pigmentative reaction to a pigment producing stimulus than a nonpigmented race." (This "pigmentogenic" characteristic was found also in the School of Hygiene studies. In these studies no difficulty was experienced as a rule in reading the reactions after forty-eight hours. A few reactions were delayed, making a later reading necessary.)

(3) Louis J. Wright "The Schick Test with Especial Reference to the Negro". Journal Inf. Dis. 21 - 1917 page 265.

Graef and Ginsberg [4] reported some tests made in the Lincoln Hospital, New York City, during an outbreak of diphtheria among the nurses in December, 1914. Thirty-eight colored females, 25 to 35 years old were tested. Of seven giving no history of diphtheria or of having had antitoxin, three gave positive Schick reactions and four negative reactions. All of five having had clinical diphtheria within six weeks prior to the test were negative to the Schick test. All of eleven carriers were negative. Twelve gave no history of diphtheria, but had received immunizing doses of antitoxin less than six weeks previous. Ten of these were negative and two positive. Three of the nurses gave a history of diphtheria eight to ten years previous; two were positive, one negative. But seven in the entire group of 38 or 18% were positive.

Forty-four patients were also tested; 9 were less than 14 months old - of these 6 or 67 % were positive.

Nine were between 14 months and five years old. Of this group 7 or 78 % were positive.

Twenty-six were adults. Of this group 18 or 69% were positive.

Park and Zingher [5] report the immunization of a group of negroes in the Howard Colored Orphan Asylum at Kings Park, L.I. They found 150 colored orphans with positive Schick, but do not state the number tested. Of the group tested 15 gave history of having had diphtheria, 5 of 7 who had had the disease one year prior to the test gave positive reactions, 7 of 8 who had had the disease four months previous gave positive Schicks.

(4) Graef and Ginsberg - "Some Observations of the Schick Test." J.A.M.A. Vol. 64, Page 1205.

(5) Park and Zingher:- Diphtheria Immunity, Natural, Active and Passive. Its Determination by the Schick Test. American Jour. P.H. May 1916, Vol. VI No. 5, Page 431.
Also- Zingher:- Schick Reaction and its Applications. New York State M. J. March, 1916. Vol. 16, No. 3. Page 118.

Because of the scarcity of material available for study and ani the small amount of published data on this subject, it was impossible to form any judgement as to the relative incidence of the positive Schick reaction in the white and colored race, and it was decided that a number of Schick tests should be made on colored children for comparison with the results previously obtained in the whites.

Three colored institutions were selected, the first was the St. Elizabeth's Home for Colored Children in Baltimore. At the time the study was started there were in this institution 232 children, of whom 43 were males, ranging in age from two months to 19 years. The second institution was the St. Katherine's Home for colored girls in Baltimore, a very small institution with only 41 girls, ranging in age from 1 to 19 as in St. Elizabeth's, but the large proportion of the girls are from 3 to 10 years old. The third institution was the Reformatory for colored boys at Cheltenham, Maryland about 45 miles from Baltimore in a sparsely settled district. The ages of the boys in this institution are from 9 to 20 years.

The material used in the work was the standard material of the New York City Department of Health. All of the tests were made by Dr. C. G. Bull. The results were read at the end of 48 hours and again in four days, with a few exceptions where the second reading was on the fifth day. At the time of Schicking, cultures were taken from the nose and throat and the condition of the tonsils noted - Virulence tests were made on all positive cultures by the Department of Immunology.

No virulent carrier was found at St. Katherines, and but one at the Cheltenham Reformatory. Virulent diphtheria bacilli were isolated from the nasal cultures of four girls at St. Elizabeth's Home, one two years old, two three years old, and one nine. All were admitted to the institution within a few months of birth. An attempt was made to discover the relation between these carriers and the Schick reaction in the rest of the institution, by a study of the possibility of contact in the sleeping quarters, dining rooms, at play, and at school, but the results were entirely negative and are not given here. It was found, however, that each child came in quite close contact with all other children in the institution.

There has been almost no diphtheria in these three institutions. There is no history of diphtheria at St. Katherine's, though the children attend the public school, and no history of diphtheria cases was obtained at the Cheltenham Reformatory. At St. Elizabeth's, there has been no diphtheria diagnosed since 1917, at which time one case occurred and a number of carriers were found. All but four of those found to be carriers in 1917 have left the institution and these four are not carriers of virulent diphtheria bacilli at present.

The Schick test was performed on 571 colored children, 298 of these were at Cheltenham, 232 at St. Elizabeth's, and 41 at St. Katherine's. Of the 571 tested, 158 were positive. The age distribution of the positive Schick Reactions is, in general, the same as was expected, that is relatively higher in the younger ages and decreasing in the older ages to a marked extent. (See Tables 11, 111, & 1V. and graph 1)

Table 11.

Schick Reaction, St. Elizabeth's Home.

Age	MALES				FEMALES				TOTAL			
	Total	Positive	Negative	Per cent Positive	Total	Positive	Negative	Per cent Positive	Total	Positive	Negative	Per cent Positive
Under 6 mos.					1	1			1	1		100.0
6-11 "	3	3	0		1	1	0		4	4	0	100.0
12-17 "	4	4	0		3	3	0		7	7	0	100.0
18-23 "	4	3	1		2	1	1		6	4	2	66.7
2 years	2	1	1		5	2	3		7	3	4	42.8
Under 3 years	13	11	2	84.5	12	8	4	66.7	25	19	6	76.0
3 years	6	3	3		13	6	7		19	9	10	47.4
4 "	6	0	6		6	3	3		12	3	9	25.0
5 "	2	0	2		9	2	7		11	2	9	18.2
6 "	4	0	4		8	1	7		12	1	11	8.3
7 "	1	0	1		17	4	13		18	4	14	22.2
8 "	1	0	1		6	0	6		7	0	7	0.0
9 "	3	0	3		16	4	12		19	4	15	21.0
3-9 yrs.	23	3	20	13.0	75	20	55	26.7	98	23	75	23.5
10 years	2	0	2		21	3	18		23	3	20	13.0
11 "	2	0	2		11	3	8		13	3	10	23.1
12 "	1	0	1		18	4	14		19	4	15	21.0
13 "	2	0	2		14	2	12		16	2	14	12.5
14 "					16	3	13		16	3	13	18.7
15 "					9	0	9		9	0	9	0.0
16 "					5	0	5		5	0	5	0.0
17 "					4	0	4		4	0	4	0.0
18 "					2	0	2		2	0	2	0.0
19 "					2	0	2		2	0	2	0.0
10-19 yrs.	7	0	7	0.0	102	15	87	14.7	109	15	94	13.8
TOTAL	43	14	29	32.5	189	43	146	22.7	232	57	175	24.6

Table 111.

Schick Results.

St. Katherine's Home for Colored Girls.

Age	Total	Positive	Negative	Per Cent Positive
Under 1				
1 year	1	1		
2 years				
Under 3	1	1		100
3 years	4	4		
4 "				
5 "	5	5		
6 "	7	5	2	
7 "	7	7		
8 "	5	4	1	
9 "	5	4	1	
3--9 years	33	29	4	87.9
10 years	3	3		
11 "	1		1	
12 "				
13 "	1	1		
14 "				
15 "	1		1	
16 "				
17 "				
18 "				
19 "	1		1	
10--19 years	7	4	3	57.1
All Ages	41	34	7	82.9

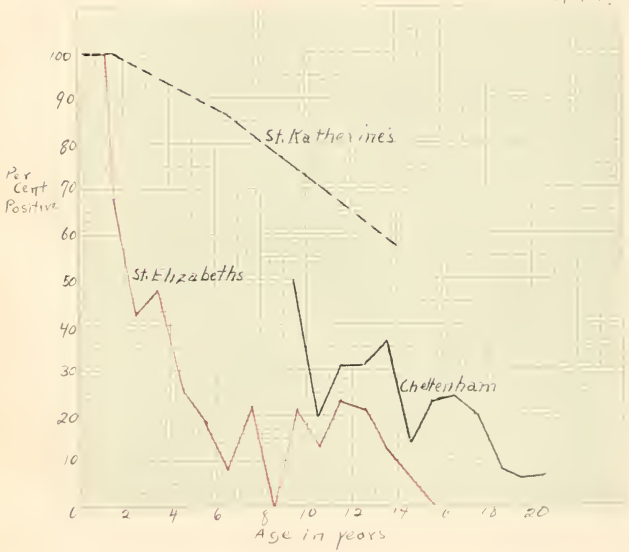
Table IV.

Schick Results.

Cheltenham Reformatory for Colored Boys - Cheltenham, Maryland.

Age in Years	Positive Schick	Negative Schick	Total	Per Cent Positive
9	1	1	2	50
10	1	4	5	20
11	6	11	17	31
12	5	14	19	31
13	13	24	37	36
14	4	28	32	14
15	11	37	48	23
16	12	35	47	24
17	7	25	32	20
18	4	24	28	8.3
19	2	15	17	6.3
20	1	13	14	7.1
All Ages	67	231	298	22.4

Graph 1.


100
90
80
70
60
50
40
30
20
10
0
Per cent Positive
St. Katherines
St. Elizabeths
Cheltenham
2
4
6
8
10
12
14
16
18
20
Age in years

No attempt has been made as yet to produce active immunity in the group of positive reactors at St. Katherine's or Cheltenham, but the positive reactors at St. Elizabeth's (57 individuals) have received three injections of the New York City Health Department toxin- antitoxin mixture. Upon re-testing the group after two months and ten days, it was found that the reaction was changed from positive to negative in 80% of the cases. The group will be re-Schicked at certain intervals to discover how many of the remainder become negative, and how long those who have become negative retain this reaction.

At the time of making the tests, data was collected making it possible to study the results at the different institutions in regard to each other and the same institution as to the incidence in groups from urban or rural districts, according to the length of residence, and the effect upon the reaction of differences in purity of race.

The results at St. Katherine's and Cheltenham have been compared with similar age groups at St. Elizabeth's. At the population at St. Katherine's is concentrated between the years from 3 to 9, only that age group is considered when St. Katherine's is compared with St. Elizabeth's. Similarly, as there are no boys at Cheltenham under 9 years of age, only the group from 9 to 20 at St. Elizabeth's is considered in the comparison of these two institutions. When compared in this way the per cent positive at St. Katherine's is much higher than at St. Elizabeth's (87.9 to 23.5) The number tested at St. Katherine's is very small, but when the formula $\sigma^2 = m\bar{p}\bar{q}\left(1+\frac{m}{n}\right)$ where, σ is the standard deviation, m is the small sample, n, the large sample, $\bar{p}$ the rate, and $\bar{q}$ equals $1-\bar{p}$, is applied to the data, it is found that the difference between the observed number of positives and the number expected, if the St. Elizabeth's percentage were applied to the number tested at St. Katherine's, is 11.6 times the standard deviation. This shows that the difference is highly significant.

The average age of the St. Elizabeth's group is 5.99 and of St. Katherine's, 6.45 . As the age is slightly higher in St. Katherine's, the variation could not be due to age differences. It is not due to prior residence because 90% of the St. Katherine's children are from urban communities, which, as will be seen, tends to lower the per cent of positives. The only apparent differences in the institutions are the size, St. Katherine's being very small, the history of diphtheria, St. Katherine's having no such history, and the lack of carriers at the latter institution. The difference may be due to other factors of which we are not aware.

In comparing Cheltenham and St. Elizabeth's, we find the same difference but not as marked. Cheltenham is higher in positive Schicks than St. Elizabeth's, but the difference when tested by the formula mentioned above, is found to be barely significant. It may be due to chance, but the probability that it is significant is 200 to 1. The fact that St. Katherine's shows the same variation tends to make the probability stronger and the data more significant. (See Table V.)

It is seen that the incidence of positive reactions varies widely in different colored institutions. It will be interesting to note how it may vary in the same institution.

At Cheltenham the percentage among those who have been in the institution less than two years is much higher than among those who have been there at least two years (See Table VII and graph 2). Correcting for age differences by applying the per centages in the various age groups of those in the institution less than two years to the number who have been there two years or over, only slightly alters the difference, which is highly significant, the probability being .00003. The variation in these two groups at St. Elizabeth's is similar but less marked and is not significant as the same difference might occur by chance in 8 out of 100 samples (See Tables VIII and IX and graph 3)

At Cheltenham the percent of positives in the rural group (48% of the total in the institution) is 31.96 while the corrected rate using the urban percentages is 16.23. The difference is over three times the standard deviation (3.45) and the probability (from Pierson's Tables) is .00028. The average length of residence in these two groups is practically the same and, as correction is made for age distribution, the data is highly significant. At St. Elizabeth's the variation is in the same direction but is so slight that it does not appear to be significant. (Tables X and Xl)

In these institutions there is a large number who are not pure negro. If the incidence of positive Schicks is affected by race, one might expect this effect to appear in the group of part white.

The results at Cheltenham and St. Elizabeth's were combined and classified by purity of race. In these two institutions the reaction is not affected by racial differences, as the group of part white or probably part white, and the negro group, have practically identical Schick incidence (Table Xll)

It is difficult to compare the results in the colored in Baltimore with the results obtained elsewhere in whites, because of the many factors which might be responsible for variations in the Schick positive populations of different institutions. The data which appears to be more nearly comparable with the Baltimore institutions, are those published by Zingher and by Blum (Table Xlll and graph 4) in three large orphan asylums in New York. In the four institutions, 3776 tests were made, of which 986 were positive, or 26.2%.

If the percentages in these four institutions are applied to similar age groups in the three Baltimore institutions, the percentage in the latter institutions (combined) would be 18.648, but as observed is 31.5, much higher than the white institutions rather than lower as might be expected if the low incidence of diphtheria in the negro is due to antitoxin in the blood. As the probability of this difference being due to chance is .000000001 the difference is surely significant, but does not prove that the negro race has fewer negative Schick reactors than the white race, because the institutions are not strictly comparable. They are differently located as to climate and geography, they differ in size and probably many other factors.

Table V.

Comparison of Schick Results at Cheltenham Reformatory and St. Elizabeth's Home (Age group 9-20)

	Cheltenham			St. Elizabeth's			
					Observed		
Age	Total	Positive	Per cent Positive	Total	Number	Per cent Positive	Expected
9-10	7	2	28.6	42	7	16.7	12
11-12	36	11	30.6	32	7	21.8	9.8
13-14	69	17	24.6	32	5	15.6	7.9
15-16	95	23	24.2	14	0	0	3.4
17-18	60	11	18.3	6	0	0	1.1
19-20	31	3	9.7	2	0	0	.2
TOTAL	298	67	22.4	128	19	14.8	3 4.4

Per cent positive at St. Elizabeth's Home if the per cent positive at Cheltenham Reformatory were applied to St. Elizabeth's population -- 26.9 compared to 14.8

$$\frac{\text{Diff}}{\sigma} = 2.567$$

$$P = .00508 \text{ or } \frac{1}{200}$$

Table VI.

Schick Results - Cheltenham Reformatory

By Time in Institution.

By Ages.

Age in Years	Less than 2 yrs. in Institution.				More than 2 yrs. in Institution			
	Positive	Negative	Total	Per cent Positive	Pos.	Neg.	Total	Per cent Positive
9	1	1	2		-	-	-	
10	1	2	3		-	2	2	
11	6	8	14		-	3	3	
12	4	12	16		1	2	3	
13	9	16	25		4	8	12	
14	3	15	18		1	13	14	
15	9	12	21		2	25	27	
9-15	33	66	99	33.4	8	53	61	13.1 Total % + 25.6
16	10	16	26		2	19	21	
17	4	7	11		3	18	21	
18	2	8	10		2	16	18	
19	2	3	5		0	12	12	
20	-	1	1		1	12	13	
16-20	18	35	53	34.0	8	77	85	9.4 Tots. % + 19.8
All Ages	51	101	152	33.6	16	130	146	11.0

Table V11.

Schick Results at Cheltenham by Time in Institution.

Age	In Institution less than two years. Positive			In Institution two years or over Positive			
	Total Tested	Number	Per Cent	Total	Observed Number	Observed Per Cent	Expected
9-10 years	5	2	40.0	2	0	0	.8
11-12 "	30	10	33.3	6	1	16.6	2.0
13-14 "	43	12	27.9	26	5	19.2	7.3
15-16 "	47	19	40.4	48	4	8.3	19.0
17-18 "	21	6	28.6	39	5	12.8	11.2
19-20 "	6	2	33.3	23	1	4.35	7.7
TOTAL	152	51	33.55	146	16	10.96	48.0

Rate among those in institution over two years if per cent positive among those less than 2 years in institution, be applied to the population of the former --- 32.88 compared to 10.96

$$\frac{\text{Diff}}{\sigma} = 4.03$$

$$P = .00003$$

Schick Results at Cheltenham [illegible]

Graph 2

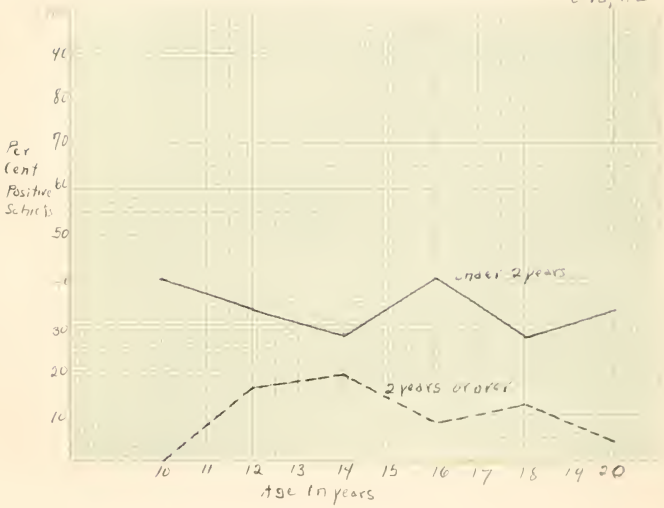


Table VIII.

Schick Results at St. Elizabeth's by Time in Institution.

Age	Residence Under 2 years				Residence 2 years or over			
	Total	Negative	Positive	Per Cent Positive	Total	Negative	Positive	Per Cent Positive
Under 2	18	2	16	88.9				
2 - 3	20	8	12	60.0	6	6	0	0
4 - 5	17	14	3	17.6	6	4	2	33.3
6 - 7	16	11	5	31.2	14	14	0	0
8 - 9	9	6	3	33.3	17	16	1	5.9
10-11	4	2	2	50.0	32	28	4	12.5
12-13	7	6	1	14.3	28	23	5	17.8
14-15	1	0	1	100.0	24	22	2	83.4
16-17	0	0	0	-	9	9	0	0
18-19	0	0	0	-	4	4	0	0
TOTAL	92	49	43	41.6	140	126	14	10.0

Table IX

Schick Results at St. Elizabeth's Home,

By length of residence in institution (age group 2-15)

Age	Total Institution			Residence in Institution two years or over			
	Total Tested	Positive	Percent Positive	Total	observed Positive	Percent Positive	Expected from per cent in entire institution
2-3 yrs.	26	12	46.2	6	0	0	2.31
4-5 "	23	5	21.7	6	2	33.3	1.30
6-7 "	30	5	16.7	14	0	0	2.34
8-9 "	26	4	15.4	17	1	5.9	2.62
10-11 "	36	6	16.7	32	4	12.5	5.34
12-13 "	35	6	17.1	28	5	17.8	4.79
14-15 "	25	3	12.0	24	2	8.3	2.88
TOTAL	201	41	20,4	127	14	11.0	21.58

Per cent positive expected in the group residing in the institution over two years if the rate in the entire institution were applied to the population of the former -- 17.0

$$\sigma^2 = m \bar{p} \bar{q} \left(1 - \frac{m}{n}\right)$$

$$\sigma = 5.41$$

$$\frac{\text{Diff}}{\sigma} = 1.38$$

$$P = .084 \text{ or } 8 \text{ in } 100$$

Table X.

Schick Reaction in Urban and Rural Groups.

Cheltenham House of Reformation for Colored Boys, February 5, 1922.

	URBAN				RURAL				
	Schick Reaction				Schick Reaction				
Age	Total Tested	Negative	Positive Number	Positive percent	Total Tested	Negative	Positive No.	Positive %	Expected positives in rural population
9	2	1	1	50.0	0	-	-	-	-
10	4	3	1	25.0	1	1	0	0.0	0.25
11	12	9	3	25.0	5	2	3	60.0	1.25
12	16	12	4	25.0	3	2	1	33.3	0.75
13	24	20	4	16.7	13	4	9	69.2	2.17
14	24	21	3	12.5	8	7	1	12.5	1.00
15	35	28	7	20.0	13	9	4	30.8	2.60
16	29	24	5	17.2	18	11	7	38.9	3.10
17	19	15	4	21.0	13	10	3	23.1	2.73
18	20	18	2	10.0	8	6	2	25.0	0.80
19	11	9	2	18.2	6	6	0	0.0	1.09
20	5	5	0	-	9	8	1	11.1	0.00
All Ages	201	16 5	36	17.9	97	66	31	31.96	15.74

Average Residence in institution

Urban group 30.17 months
Rural group 31.31 months.

Percentage in rural group if urban percentages were applied to rural group 16.23 against 31.96

$$\frac{\text{Diff}}{\sigma} = 3.45$$

$$\text{P.} = .0002803$$

Results of Cheltenham by Prior Residence

Table XI

Schick Reaction at St. Elizabeth's Home

By Prior Residence.

	URBAN				RURAL			
Age	Total	Schick positive	Schick negative	Percent positive	Total	Schick positive	Schick negative	Percent positive
Under 2 Years	13	12	1	92.4	5	4	1	80.0
2-3 "	18	6	12	33.4	8	6	2	75.0
4-5 "	12	1	11	8.3	10	3	7	30.0
6-7 "	23	5	18	21.8	6	0	6	0.0
8-9 "	16	1	15	6.3	10	3	7	30.0
10-11 "	28	4	24	14.6	8	2	6	25.0
12-13 "	22	6	16	27.3	12	0	12	0
14-15 "	16	3	13	18.8	8	0	8	0
16-17 "	6	0	6	0	3	0	3	0
18-19 "	3	0	3	0	0	0	0	0
TOTAL	157	38	119	23.2	70	18	52	26.4

Mean length of Residence at institution

Urban 50.3 months

Rural 41.1 months.

In 5 cases prior residence is unknown.

Table XLI.

Schick Results and Purity of Race

Cheltenham Reformatory and St. Elizabeth's Home.

	Negro				Part white or probably part white			
Age	Total	Positive	Negative	Percent Positive	Total	Positive	Negative	Percent Positi
Under 2 yrs.	13	12	1	92.4	5	4	1	80.0
2-3 "	20	9	11	45.0	6	3	3	50.0
4-5 "	16	4	12	25.0	7	1	6	14.3
6-7 "	23	4	19	17.4	6	1	5	16.7
8-9 "	23	5	18	21.7	3	0	3	0.0
10-11"	40	11	29	27.5	18	2	16	11.1
12-13 "	76	23	53	30.6	14	1	13	7.1
14-15 "	90	16	74	17.8	13	2	11	15.4
16-17 "	81	17	64	21.0	7	2	5	28.6
18- 19"	42	3	39	7.1	7	3	4	42.8
20 years	13	0	13	0.0	1	1	0	100.0
TOTAL	437	104	333	23.8	87	20	67	23.0

Table XIII.

Schick Results in Four White Institutions in New York City *

Age	Total Tested	Negative	Positive	
			Number	Per cent
1-5 mos.	97	76	21	21.6
6-11 "	115	43	72	62.6
1 year	221	108	113	51.1
2-3 "	471	300	171	36.3
4-5 "	552	421	131	23.7
6-7 "	444	347	97	21.8
8-9 "	597	462	135	22.6
10-11 "	584	459	125	21.4
12-13 "	506	416	90	17.8
14-15 "	189	158	31	16.4
TOTAL	3776	2790	986	26.2

*Three large orphan asylums in New York City, Zingher (A) Reprint series No. 42 New York City Health Department , also Am. J. Dis. Child. Chicago-1916 X 1,269-275 and Home for Hebrew Children (New York) Blum- New York, Med. J. 1918, CVII 208-210.

Table XlV.

Schick Reaction in Three Colored Institutions.

Age	Total	Negative	Positive Observed Number	Positive Observed Per cent	Expected based on white experience (Table)	Diff. observed and expected	Diff./σ
1-5 mos.	1	0	1	100.0	.221	.779	1.88
6-11 "	4	0	4	100.0	2.495	1.505	1.53
1 year	14	2	12	85.7	7.153	4.847	2.50
2-3 years	31	15	16	51.6	11.271	4.729	1.71
4-5 "	28	18	10	35.7	6.663	3.337	1.44
6-7 "	44	27	17	38.6	9.648	7.352	2.56
8-9 "	38	25	13	34.2	8.171	4.829	1.87
10-11 "	62	46	16	25.8	13.329	2.671	.79
12-13 "	91	66	25	27.5	11.763	13.237	3.94
14-15 "	106	88	18	17.0	17.421	.579	.15
*TOTAL	419	287	132	31.5	78.135	53.865	6.40

Percentage positive in colored institutions if the rate in the white institutions were applied to the colored population -- 18.648 as compared with 31.5

Probability the difference is due to chance is less than .0000000001. (Pierson's Tables)

Formulae used

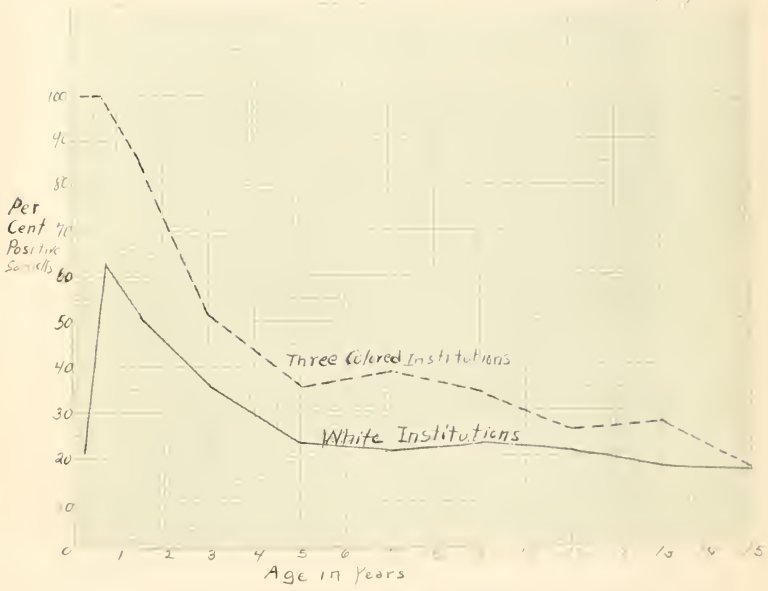
$$\text{Expected Mean} = m\,\overline{p} + \frac{M}{N+Z}(\overline{q} - \overline{p})$$

$$\sigma = m\,\overline{p}\,\overline{q}\,(1 + \frac{M}{N})$$

* 152 cases over 15 years omitted.

Schick Results in White and Colored [illegible]
Baltimore

Graph 4



The incidence of positive Schick reactions varies widely in comparable groups of negroes in different institutions as shown by the St. Katherine's and St. Elizabeth's results.

Wide variations in the incidence are found in the same institutions in similar age groups according to length of residence in the institution and the prior residence, (whether urban or rural) as is well shown in the Cheltenham data.

Purity of race is not a factor in the variations of the percentages of positives, as the percentages in the pure negro type and those who are part white is practically identical.

The three colored institutions have a greater percentage of positive Schicks than the four large white institutions with which they have been compared.

There is no evidence of higher negative Schick incidence in negroes than in whites. The incidence varies widely in different white institutions as well as in the colored institutions and the differences between the colored in Maryland and the white in New York are within the range of this variation.

The results obtained in the three Maryland institutions prove only that the incidence of Schick reactions varies widely in different institutions and in the same institution due to several factors. Of these, age is the most obvious and important. Prior residence and length of stay are important factors. The possibility of contact with diphtheria cases or carriers is probably a large factor. Race is not a factor in the three institutions studied.

The results do not prove that the low diphtheria incidence in the negro is due to relatively more negative Schicks. The data are insufficient to prove that this is not the case though it suggests that the difference in the two races are due to other factors than antitoxin in the blood.

In order to determine this point, more and better data are needed. Samples of white and colored from the same or similar populations should be tested. They should be resident in the same part of the city, living under identical conditions and affected by the same factors save only race.